Chapter 1
Understanding Stormwater Pollution

This chapter provides an overview of general stormwater information to answer the questions: What is stormwater? Why is it a problem? And, why is there a need for innovative stormwater treatment technologies? In addition, this chapter outlines the common pollutants in stormwater, examples of pollutant sources, and their related impacts.

1.1. What is Urban Stormwater?

Urban stormwater occurs when precipitation falls onto impervious surfaces (such as parking lots and roads) and flows over the ground surface rather than infiltrating through the soil. Without infiltration, water flows over land and collects sediment and other non-point source pollutants that lie in its path. In urban (or developed) environments, stormwater contaminants originate from different land use types and activities occurring within the watershed. These can include fertilizing lawns and oil or gas spills at automobile service stations.

Urban stormwater becomes a problem when pollutants such as pesticides, fertilizers, animal wastes, sediments, nutrients, and heavy metals, deposited on the ground surface, flow into and contaminate nearby surface waters. The increasing amount of impervious cover, particularly in developing and developed urban areas, reduces the ability of stormwater to be treated through natural processes such as ground infiltration. Implementing innovative stormwater technologies to treat and control stormwater is one way to reduce pollutant concentrations before being discharged into sensitive surface waters, groundwater, and wetlands.

1.2. Common Stormwater Pollutants

Contaminants that are typically found in stormwater are associated with land use activities in urban or developed areas. Table 1.1 summarizes the pollutants commonly found in stormwater, explains their sources, and gives examples of their potential related impacts.

Table 1.1. Common stormwater pollutants, sources, and possible impacts.

Stormwater Pollutant	Examples of Sources	Possible Impacts
Nutrients: Nitrogen, Phosphorus	Animal waste, fertilizers, failing septic systems, atmospheric deposition, vehicular deposition	Algal growth, reduced clarity, other problems associated with eutrophication (oxygen deficits, release of nutrients and metals from sediments)
Sediments: Suspended in water column and deposited on bottom of water body	Construction sites, other disturbed and/or non-vegetated lands, eroding banks, road sand	Increased turbidity, reduced clarity, lower dissolved oxygen, deposition of sediments, smothering of aquatic habitats including spawning sites
Organic Materials	Leaves, grass clippings	Oxygen deficit in receiving waters, fish kills, turbidity
Pathogens: Bacteria and Viruses	Animal waste, failing septic systems, dumpsters	Human health risks associated with drinking water supply, consumption of affected shellfish and swimming beach contamination
Hydrocarbons: Oil and Grease, PAHs such as Napthalenes & Pyrenes	Industrial processes, automobile wear, emissions and fluid leaks, waste oil	Toxicity of water column and sediment, bioaccumulation through the food chain
Metals: Lead, Copper, Cadmium, Zinc, Mercury, Chromium, Aluminum, others	Industrial processes, normal wear of auto brake linings and tires, automobile emissions and fluid leaks, metal roofs	Toxicity of water column and sediment, bioaccumulation in aquatic species and through the food chain, fish kills
Synthetic Chemicals: PCBs, Pesticides	Pesticides (herbicides, insecticides, fungicides, rodenticides), industrial processes	Toxicity of water column and sediment, bioaccumulation through the food chain, fish kills.
Chlorides	Road salting and uncovered salt storage	Toxicity of water column and sediment
Trash and Debris	Litter washed through storm drain networks, commercial parking lots adjacent to surface water, overflowing trash barrels and dumpsters	Degradation of surface water aesthetics, threat to wildlife

(Adapted from Minnesota Urban Small Sites BMP Manual).
Note: See glossary for unfamiliar terms.